The Concept of C2 Communication and Information Support

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Abstract

In the Czech Armed Forces, we have taken a new look at the communication and information systems function. This new opinion and approach issue from integration of functions and downsizing of CIS equipment. GSM telephone is a typical example of this matter. It is an equipment of communication system but information system as well. In many cases the border between an information system and a communication system is hardly identifiable. That is why integrated C2 Communication and Information Support (CISu) should be mentioned rather than communication support and information support separately. CISu is a process (information activity) that sustains Command a Control by battle information. CISu is provided by the Communication and Information System (CIS). CISu is the result of CIS function. C2 information responsibility is one of the reasons for CISu definition. O-6 is responsible for providing communication on mechanized brigade level. Not only communication is important, but information system function too. By this concept, we can centralize our CISu request on O-6 and signal company. In the past, we used to separate information support and communication. Now, according to this concept, we have specified a single integrated process, the Communication and Information Support of C2.

1. Introduction

Provisions for a sustainable command and control are a prerequisite of an effective mission conclusion. To learn battle area and situation for command and control, information is necessary for both the commander's decision making and subordinates leading. The commander is to make a decision that contains timing of action plans to accomplish the mission (objective function) while knowledge and specific information describing the particular situation are utilised. Timing of the subordinates is under commander's responsibility done through control and information.

2. The Communication and Information Support of Command and Control

To determine the CISu process results, it is necessary first to determine the CISu-user (commander) interface; describe what the CISu process result should be. The theory is necessary to be able to describe both formally and contently the process of meeting commanders' and staff's information demand. The functions of information acquisition,

collection, maintenance, processing, security and transmission are vital for the commander and his subordinates to provide for the command and control process. These process functions are accomplished by communication and information support. Support hereof should be understood as providing service required for carrying out certain action. ***CISu is a process (information action) supporting command and control with information***. It is done through information acquisition, maintenance, processing, transmission, security and presentation. CISu is determined with proper identification of information sources, management of information flows in time (information pushing or pulling) and with utilisation of information in favour of command and control.

CISu comprises two components – communication support and information support. The communication support puts stress on the transmission function and understanding of transmitted information. The information support emphasizes information processing, maintenance, retrieval and presentation. The communication support component accents authenticity, accuracy, timeliness of transmitted information. The information component, on the other hand, data operations so that the recipient have got enough relevant information for decision-making and control. Together, the two components make up a logic unit offering required information. CISu in the command and control system is carried out with the communication and information systems (CIS). The role of CISu within the command and control process is shown in Figure 1.

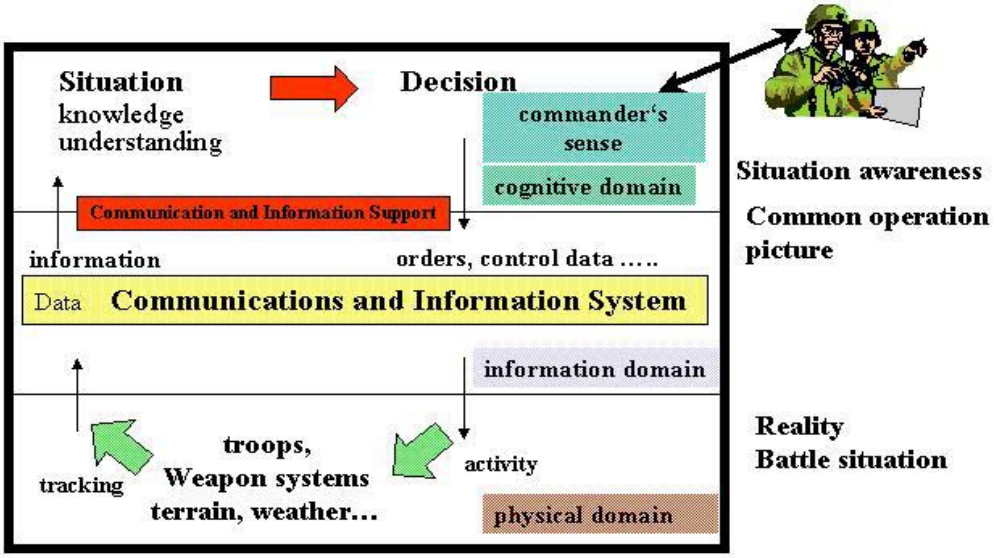

Fig. 1 Communication and Information Support role within C2 process

So that CISu is able to fulfil its mission, it should be: complex, real, authentic, resistant, unified and interoperable. CISu complexity lies in it should provide for comprehensive information coverage of all command and control domains, should be arranged in line with commander's and staff's instruction, should consider situation, comply the work procedures

and methods. CISu reality is attained when the information image it gives corresponds the actual situation. Authenticity of CISu is reached when received information is really sent by mentioned originators. CISu is resistant when it is in the condition no one of its features is invaded. Unity of CISu is attained when the output is a unified, complete joint picture of the battle area picture on every level of command. CISu interoperability consists in a reliable information exchange with allied forces. The relation between CISu and CIS is shown in Figure 2.

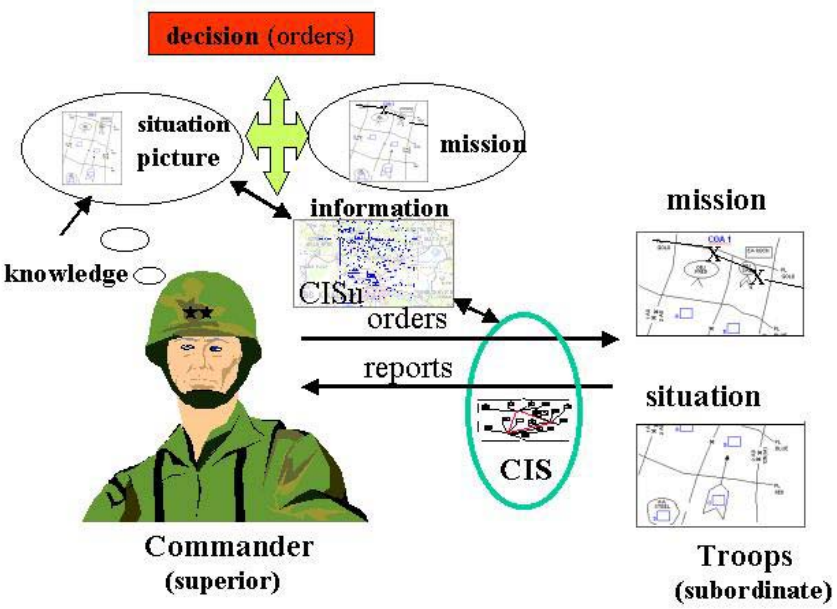

Fig. 2 Relation between CISu and CIS

2.1. CISu determination rationale

A reason of CISu determination, introduction of a new integrated view of CIS function, is the fast progress in ICT, digitisation and miniaturization of assets and changing over for software applications of the communication and information functions. Number of assets thus integrates the communication and information functions divided by pure logic boundaries. Their actual utilisation (as an element of communication or information system, if applicable) depends on user's specific requirements. Examples of such assets and systems comprise GSM telephone or Staff Information System (military intranet).

C2 information responsibility is another of the reasons for CISu definition. O-6 is responsible for providing information on brigade level. O-6 manages the brigade level CIS, which is created by a signal company. Not only communication is important, but information system function too. CIS provides the brigade level staff with CIS potential that can satisfy their information needs. The commander and the staff can utilize this potential in the areas of transmission, processing and output of battle information. By this concept, we can centralize our CISu request on O-6 and signal company. O-6 plans and manages deployment and

operation of brigade CIS according to situation and battle priorities. CIS user services are configured according to information needs defined by the commander and the staff to provide relevant, real-time, correct information. In the past, we used to separate information support and communication. Now, according to this concept, we have specified a single integrated process, the Communication and Information Support of C2.

3. ICT potential for possible CISu improvement

What is the ICT potential residing in as far as command and control concerned? Information is compared to glue that bonds organization into one unit stuck together to accomplish the object function. ***Potential of ICT rests mainly on the ability of creating and reproducing the picture of military important reality. The picture is exploitable for the purposes of command and control, decision-making support, planning, project control, or in favour of troops education and training.*** Particularly information disseminating and sharing allows the organization to adopt uniform processes, synchronized actions, and teamwork in the processes. It enables information sharing in combat action based on common database, uniform view of the battle space. All of the involved commanders and staff members can see the situation in unified manner, usually in a reality-close condition, and can synchronise their action according to the plan to accomplish their mission. Thus, informatics considerably limits the effect of "fog of war", i.e. uncertainty in knowledge of friendly and/or enemy forces conditions. Information sharing on database principle (updated data image of reality) is to be done by means of situation visualization. The information image in computer environment uses presentation in the form of impressions (electronic overlays). ICT quality reflects in image quality (reality description), depiction depth, range, structure system, form of visualisation, form of information image presentation, etc. The perception is easy to understand, as it is based on parallel imaging of all objects of the visualised information. It may highlight positions of military key information (target detection, threshold limit exceeding).

The ICT communication and visualization capabilities allow formulating of the essence of the problem in an easy-to-understand, by single steps, reprojectable form, useful for intent explanation, for example. The subordinate level receives the intent presentation file and can project it several times, note the mission key instants, realize the critical moments and better understand its role and contribution to the mission questioned.

ICT can make a substantial contribution with system knowledge support of the defence department personnel, readiness to accomplish tasks as assigned, building of "knowledge armed forces". It is utilisation of ICT capacity for formation, capture and distribution of knowledge to all defence department personnel. The technology enables knowledge sharing, fitting each personnel with necessary know-how of more qualified decision-making and more precise operation exercise while the following methods of knowledge storage, reporting a making are used:

- Data analysis of the concerned area ("history analysis") and acquisition of new derived knowledge, identification of enemy's new tactical courses of action, new ways of fire distribution and share this new knowledge with the whole users domain,

- Generation of knowledge systems that clarify the system function principle, concerned area principle, applicable to fast problem orientation, acquisition of knowledge and mind,
- E-learning for distance education,
- Computer aided simulations for acquisition of military important knowledge and experience of battle actions and crisis management, battle employment training, etc.

New applications that enable new forms of communication, information processing and control actions support arise in these days, particularly in the sphere of commercial technologies. The problems related to the applications are from the field of concept definition and detailed project for a commercially successful (user-wished, useful and friendly) application rather than development of the application. ICT promises a huge potential for command and control measures, however facing a problematic lack of creative invention in its implementation, of developing successful applications, of interconnection of individual technologies into a useful unit.

3.1. CISu development opportunities

The purpose of the communication and information support of command and control is creation of sufficient information potential to provide for the command and control process. Information should be presented readably and easily-to-understand by the recipient so that save his psychic strength. Support of information processing, searching and presentation is also a part of the communication and information support.

It is vital for utilisation of CIS potential that staff (teams) change their working practices in the command and control process and utilise the integrating capacity of ICT. To use a suitable concept (model) of staff practice utilising the ICT capabilities for attainment of new command and control quality. By means of research, to identify what quality the new technologies bring to the command and control process, what are the ways of planning and control processes modification. At the same time, to explore possible applications of the new technologies in each type of action, particularly in intent development, decision making and action control. The following is a list of the essential trends whose development the defence research in the CISu-area should concentrate on:

- Command and control processes and their information requirements,
- Synergic integrated concepts of C2-system,
- Military missions experience formulated in Military Operation Requirements,
- Operation architecture research (CISu in operations and actions),
- Support of information processing/ retrieval by artificial intelligence,
- Visualization of actions, suitable forms of information presentation,
- Techniques of learning CIS users communication and information literacy,
- Sensors: technology and systematic development as a branch,
- Military prognosis research (combat models),
- Man - machine interface.

4. CISu and the Synergic Integrated Concepts of C2 systems

The environment of CISu is the communication and information systems being a command and control system element. The modern militaries have defined and developed synergic integrated concepts for the command and control systems to improve their logic, integration, systematisation. The examples of such concepts comprise Network Centric Warfare, battlefield digitisation and more. The synergic integrated concept defines policy, objective, basic principles, course of action, systematisation rules, benefit etc. It is a summary of systemic, logic and technologic principles and analyses. The concept result is application of new sensor types, new approaches to information distribution (information distribution models), CIS services systematisation, information visualisation, data fusion etc. The concept purpose is synergic effect resulting from arrangement of the command and control system; staff practices defined in the operation procedures; accelerated, more effective and easier process of command and control. The synergic integrated concept of battlefield digitisation focuses primarily on how to create the command and control technical assets, especially sensors. The synergic integrated concept of Network Centric Warfare concentrates on integration of separated C2 systems into a single unit that would provide integrated CISu. Promising, however still undefined, will be the concept focused on the warfare knowledge support of command and control.

5. Conclusion

The paper discusses the communication and information support theory of command and control. It is taken as an information action (process) to support C2 information domain. CISu is based on exploitation of CIS services. Their forms are under boosting development integrating their terminal devices. The GSM phones are an example of the integration. The integration, however, causes also information overload of the users. The ways of its avoidance consist in establishment of rules of behaviour of the CIS users (originators) on one hand side and of efficient filter methods for information recipients on the other. Other significant trends comprise specifications of synergic integrated concepts for the command and control systems, particularly battlefield digitisation and Network Centric Warfare. The concepts purpose in definitions of principles for sophisticated C2 systems building so that the ICT potential could be used for command and control provisions.

The communication and information systems are very complex and costly systems. Their utilisation in the command and control systems depends on users' requirements and capacity. Learning and creative utilisation of CIS services is a challenge for all military users to get the command and control process to a higher quality level. The mission of the Signal Corps is, based on resources, to provide the users with CIS service as required, inform of capacities and run CISu for commanders and staff effort.

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